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Substance use, generation and time in the United States: The modifying role of gender for immigrant urban adolescents

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Abstract

Although immigrant youth have lower rates of substance use than US born youth, whether substance use varies by generation and time in the US is unclear. This study examines adolescent alcohol, tobacco and marijuana use by generation/time in US (i.e., first generation, in US ≤4 years; first generation, in US >4 years; second generation; and third generation or higher). Data come from a 2008 survey of Boston, Massachusetts public high school students (n=1,485). Multivariable logistic regression models were used to examine the association between generation/time in the US and risk of past 30-day substance use, adjusting for age and race/ethnicity. To determine whether the associations differed by gender, we fit gender stratified regression models. The prevalence of substance use was lowest among immigrants who had been in the US ≤4 years. Among girls, generation/time in US was not related to alcohol use or to tobacco use. For boys, being an immigrant regardless of number of years in the US, as well as second generation was associated with a significantly lower risk of tobacco use, compared to third generation youth. Additionally, immigrant boys who had been in the US ≤4 years had a significantly lower risk of alcohol use. Among both boys and girls, all first and second generation youth were significantly less likely to report marijuana use compared to third generation youth. Immigrant youth have a lower risk of alcohol, tobacco and marijuana use relative to US born youth; however the protective effect of foreign nativity on alcohol was eroded much more quickly than for tobacco or marijuana. The effects of generation and time in US on substance use differ by gender and the particular substance.

Keywords

Substance Substance use; youth; immigrants; time in USA; gender; effect modification; USA

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Introduction

The foreign-born population in the United States (US) increased from 4.7% in 1970 to 12.9% in 2010 (Greico & Trevelyan, 2010). Immigrant children and children of immigrant parents are currently the fastest growing segment of the US population; more than one-fifth of children <18 years are foreign-born or have at least one foreign-born parent (Count, 2007; Shields & Behrman, 2004; Zhou, 1997). In light of their large and growing presence, the health and health behavior of foreign-born youth and US-born youth with foreign-born parents will impact the overall well-being of the US population. For example, substance use is one of the more prevalent adolescent health risk behaviors associated with adverse health, social and economic consequences (Epstein et al., 1998; Krohn et al., 1997). In addition, alcohol, tobacco and marijuana use have been deemed priority health risk behaviors by the Centers for Disease Control and Prevention (CDC) in part because of their contribution to the nation's leading causes of morbidity and mortality (Eaton et al., 2010).

Alcohol, tobacco and marijuana are often the first and most prevalent substances of use or misuse among adolescents, alcohol and tobacco because they are legal (though not for adolescents), and marijuana because it is relatively easy to purchase and has a low marginal cost (Kandel et al., 1992; Pacula, 1997). The problem of substance use is not randomly distributed across social groups. Rates of substance use differ by nativity status and foreign-born youth have been shown to have lower rates of use as compared to their native-born counterparts (Blake et al., 2001; Mullen Harris, 1999; Pena et al., 2008; Prado et al., 2009). However, most studies on substance use among immigrants have assessed differences by nativity (i.e., US vs. foreign-born nativity) or by generation (i.e., first, second, third) (Hussey et al., 2007; Mullen Harris, 1999; Prado et al., 2009; Springer et al., 2007). The vast majority of this work has found that foreign-born youth are at lower risk for substance use vis-à-vis their US born peers, but that risk increases linearly among second and third generation US-born youth (Hussey et al., 2007; Mullen Harris, 1999; Pena et al., 2008; Prado et al., 2009). Rarely have investigators examined the effects of more detailed immigration related variables on substance use among youth, such as length of residence in the US among first generation youth, or parental nativity (Blake et al., 2001; Gfroerer & Tan, 2003).

The influence of gender with respect to the nativity-substance use association is often overlooked (Borges et al., 2006; Gonzalez-Castro, 2007). However, some research suggests that the association differs by gender, with a larger percentage of foreign-born males using substances compared to foreign-born females, but with exposure to US norms generally having a stronger effect on substance use among foreign-born females (Amaro et al., 1990; Borges et al., 2006; Vega et al., 1998). Unfortunately, the majority of these studies have been conducted on adult samples and the results of the extant research are inconclusive with regard to the role of gender, particularly among adolescents (Gonzalez Whal & McNulty Eitle, 2010). Taken together, the results of existing work suggest that the relationship between substance use and immigration-related factors are more complex than previously thought. In light of the demographic importance of immigrant children and children of immigrant parents in the US, the consequences of substance use on overall well-being, and the need to identify population groups most at risk of substance use in order to develop effective preventive interventions, it is imperative to examine the problem of substance use across multiple immigration-related factors among immigrant youth of various racial/ethnic backgrounds. Therefore, we undertook the present study with the following objectives: 1) to generate prevalence estimates of past month use of alcohol, tobacco and marijuana among Boston public high school students; 2) to examine risk of past month alcohol, tobacco and marijuana use across multiple immigration-related factors controlling for known risk factors;

and 3) to test whether the relationship between immigration related factors and risk of past month alcohol, tobacco and marijuana use is moderated by gender.

Methods

Data for the current study come from the 2008 Boston Youth Survey, a survey of 9th-12th graders in public schools in the city. All 32 public high schools in Boston were invited to participate in the study, 22 agreed. Within each school, we randomly selected approximately 4-5 classrooms for survey administration. Every student within the selected classrooms was invited to participate. Passive consent was sought from students' parents prior to survey administration and informed assent was sought from respondents. Of the 2,725 students enrolled in the classrooms selected for participation, 1,878 completed a survey for a response rate of 68.9% (AAPOR, 2011). Students who did not complete a survey either: (a) chose not to participate (3.6%); (b) were not permitted by their parent to participant in the survey (1%); or (c) were absent from school on the day of survey administration (26.6%). The Human Subjects Committee at the Harvard School of Public Health approved the original study. Northeastern University's institutional review board approved the secondary data analysis for this study.

Outcome variables

The main outcomes of interest were past 30-day use of alcohol, tobacco and marijuana. The Boston Youth Survey included three items about past month use of these substances (e.g., "In the past 30 days, on how many days did you drink alcohol?"), which were adapted from the 2005 Youth Risk Behavior Surveillance System (YRBS) survey (CDC, 2004). Response options were never, 1-2 times, and 3 or more times. We recoded each of the variables to reflect any past 30-day use of each substance.

Predictor variable

We sought to gain a more nuanced understanding of substance use among adolescents by capitalizing on the multiple immigration-related variables in the 2008 Boston Youth Survey. We constructed a new variable that combined three questions: (a) nativity and time in the US in which students were asked if they were foreign or US-born, if foreign-born, if they had been in the US >4 years or ≤4 years); (b) maternal nativity, and (c) paternal nativity. Students were classified as *first generation/recent immigrant* if they were foreign-born and had been in the US for ≤4 years; students who were foreign-born and had been in the US for >4 years were classified as *first-generation/non-recent immigrant*; US-born students who had at least one foreign-born parent were classified as *second generation*, and those with two US-born parents were classified as *third generation* or higher. Similar measures have been used in previous studies of immigrant samples (Alegria, Scribney et al., 2007; Alegria, Shrout et al., 2007; Almeida et al., 2011).

Demographic covariates included age group (≤14, 15, 16, 17, ≥18), gender (self-reported sex), race/ethnicity and country of origin. To assess race students were asked to indicate if they were White, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or some other race. Students were permitted to mark multiple options. We combined Latino ethnicity and race to create a race/ethnicity variable with the following five categories: (a) Latino; (b) Non-Latino Black/African American; (c) Non-Latino White; (d) Non-Latino Asian, and (e) Other. The latter group included bi-or multiracial students, Native Hawaiian and other Pacific Islanders, American Indian/Alaska Natives, and those who were non-Latino and who did not specify a race. To assess students' country of origin, one item asked: "Are you, or is your family from…" followed by a list of places (i.e. Haiti, the Dominican Republic, China, Jamaica, Vietnam, El

Salvador, Cape Verde, Colombia, Ireland, and Puerto Rico). The listed countries were chosen based on Census data indicating they were the largest immigrant groups in the city of Boston. There were two additional response options: "Another country, not on this list", and "My family is mainly from the US". Students were encouraged to mark all options that applied to them, and many students chose multiple answers. Importantly, all respondents answered this question, not just immigrants.

Gender was assessed as a potential effect modifier of the relationship between generation/time in the US and substance use. We assessed family structure (categorized as dual or single parent household); hours spent on homework per day (<1 hour, 1-3 hours, or >3 hours) and perceived drug/alcohol problems in the neighborhood as potential risk factors for alcohol, tobacco and marijuana use.

Statistical Analysis

First we examined the characteristics of the study sample using descriptive statistics including an assessment of country of origin by race/ethnicity and generation/time in the US. We also estimated the bivariate relationship between the predictor variable socio-demographic variables, risk factors and past 30-day use of each substance using Chi-Square test. Next, multivariable logistic regression was used to examine the association between generation/time in US and past month alcohol, tobacco and marijuana use. In the multivariable modeling, we controlled for clustering of students within schools by fitting a generalized estimating equation (GEE) model with an exchangeable correlation matrix, and specified school as the cluster variable. We generated relative risks (i.e., prevalence ratios) rather than odds ratios because the outcomes of interest were common in the study population (i.e. >10%) (Kelsey et al., 1996). We fit GEE models using PROC GENMOD in SAS with school specified as the subject in the REPEATED statement (SAS Institute, 2008). We ran a series of three multivariable regression models to estimate the unadjusted and adjusted associations of generation/time in the US and alcohol, tobacco and marijuana. In model 1, we estimated the crude association of generation/time in the US and each substance. Model 2 was adjusted for socio-demographic factors and model 3 controlled for both socio-demographic factors and the three specified risk factors. To examine whether gender moderated the relationship between generation/time in US and risk of use for each substance we specified an interaction term and ran a model for alcohol, tobacco and marijuana. Finally, we fit gender-stratified models, which were adjusted for all socio-demographic variables and risk factors, to examine if the association between generation/time in the US and past 30-day substance use differed for boys and girls.

Results

Characteristics of the sample

The most commonly reported countries of origin were the Dominican Republic (10.4%), Puerto Rico (8.8%), and Haiti (8.8%). Twelve percent (12.2%) reported that they had more than one country of origin, and 15.1% indicated that they were from another country not on the list (Table 1). Among the total sample and among Blacks, Whites, and those in the "other" racial/ethnic group, the most commonly reported country of origin was the US only. Among Latino youth, the most commonly reported country of origin was the Dominican Republic (30.5%), followed by Puerto Rico (25.2%). Most Asian youth reported that their families were from China (61.1%) or Vietnam (24.7%). Twenty-nine percent of the sample was foreign-born, nearly one-third of whom had been in the US ≤4 years. Forty percent were second generation and the remaining 31% were third generation or higher. Not surprisingly, 61.6% of third generation youth reported that their families were from the US only.

Prevalence of substance use

The prevalence of alcohol, tobacco and marijuana in the entire sample was 38.3%, 12.6% and 19.2% respectively (Table 2). There were statistically significant differences in substance use by generation/time in the US. Specifically, there was a statistically significant overall difference in prevalence of use for tobacco and marijuana by generation/time in US. Although there was not a statistical trend for alcohol use by generation, the 30-day prevalence of drinking was significantly lower among recent immigrants compared to the other three groups.

Relative risk models

Table 2 shows the relative risk of past 30-day substance use by generation/time in the US. Model 1 shows the unadjusted relative risk of past 30-day use of each of the three substances by generation/time in US with third generation as the reference group. Relative to third generation youth, all groups had a significantly lower risk of tobacco use. Specifically, recent immigrants had a 75% lower risk and non-recent immigrants and second generation youth each had a 56% lower risk relative to third generation. With regard to alcohol use, the pattern of increased risk with increased time in the US was not as pronounced; only recent immigrants had a significantly lower risk (41% lower), relative to third generation youth. The results for marijuana use are similar to those for tobacco use. Relative to their third generation peers; recent immigrants had an 89% lower risk, while among non-recent immigrants and third generation youth the risks were 58% and 48% lower, respectively.

Models 2 in Table 2 are adjusted for socio-demographic variables (i.e. gender, age and race/ethnicity). With the addition of these socio-demographic variables, the risk of tobacco use by generation/time in the US remained unchanged. Each group continued to have a significantly lower risk relative to third generation: (73%, 48% and 43% lower risk among recent, non-recent and second generation, respectively). Model 2 for alcohol use shows that adjusting for these socio-demographic variables did little to change the magnitude of the association: only recent immigrants had a significantly lower risk of alcohol use (38% lower) relative to their third generation counterparts. Model 2 for past 30-day marijuana use shows that after adjusting for socio-demographic variables, all generation/time in US groups had a significantly lower risk compared to third generation youth: risks were 88%, 61% and 50% lower among recent immigrants, non-recent immigrants and second generation youth, respectively.

The final models (model 3) are fully adjusted for socio-demographic variables and risk factors (hours spent on homework, family structure and perceived neighborhood problems with alcohol and drugs). With inclusion of these variables tobacco use across generation/time in US showed a pattern similar to the previous two models; 74%, 47% and 43% lower risk among recent immigrants, non-recent immigrants and second generation youth respectively, relative to third generation youth. Model 3 for alcohol use illustrates that only recent immigrants had a significantly lower risk (34% lower) relative to their third generation peers. For marijuana use, all other groups continued to have a significantly lower risk relative to the referent group: 87%, 59% and 50% lower among recent immigrants, non-recent immigrants and second generation youth respectively.

Gender differences in generation/time in US-substance use relationship

In a series of models we found that the interaction between gender and generation/time in the US was not statistically significant for alcohol, tobacco, or marijuana use, indicating that gender did not moderate the association between substance use and generation/time in the US (data not shown). However, the relative risk of each substance across generation/time in

US did vary by gender. Results of the gender stratified multivariable logistic regression models are displayed in Figures 1a and 1b. The association between generation/time in US and past 30-day tobacco use was statistically significant among boys, but not girls. For boys, recent immigrants, non-recent immigrants and second generation youth were significantly less likely to have used tobacco than third generation youth. Among both boys and girls there was a statistically significant association between generation/time in US and past 30-day marijuana use, with recent immigrants, non-recent immigrants and second generation youth being less likely than third generation youth to use marijuana in the past month. With the exception of recent immigrant boys being less likely than third generation boys to use alcohol, there was no statistical association between generation/time in US and alcohol use for other generation/time in US among boys or for girls overall.

Discussion

Researchers have established that substance use differs by nativity and generation status (Blake et al., 2001; Mullen Harris, 1999; Pena et al., 2008; Prado et al., 2009). However, fewer studies, have investigated the relationship between substance use and more detailed immigration-related factors to test whether change in substance use occurs within a generation, not just across generations (Blake et al., 2001; Gfroerer & Tan, 2003). This kind of detailed test of the theory of "segmented assimilation" among foreign-born youth to risk behaviors such as substance use among US-born youth has been lacking, particularly among adolescents. In this study, we begin to fill this gap in the literature among a sample of urban high school students in Boston, MA. Our prevalence estimates of past month alcohol, tobacco and marijuana use are consistent with rates found among high school students in Monitoring the Future Study (Johnston et al., 2011). In general, alcohol, tobacco and marijuana use increased with generation and years residing in the US. This is consistent with the bulk of the literature on substance use and immigrant status for adults (Alegria, Scribney et al., 2007; Strunin et al., 2007).

However, our results for adolescents suggest that the picture is much more complex. Tobacco and marijuana use followed a linear trend of increasing incrementally with additional years in the US and among second generation US-born youth. Alcohol use followed a different pattern; while risk was lowest among recent immigrants, risk among non-recent immigrants was indistinguishable from US-born youth. These findings highlight the notion that for new immigrant youth the first four years in this country may be a critical period in terms of adopting the behaviors of US-born youth, particularly with regard to alcohol, the most commonly consumed substance among young people (U.S. Department of Health and Human Services, 2007). Extant research has noted the importance of time in residency in the US for outcomes such as substance use for immigrant youth, but did not pinpoint when it begins to converge with that of US-born youth (Kulis et al., 2010; Martinez et al., 2011). Additionally, while datasets including the Youth Risk Behavior Survey routinely collect information on number of years residing in the US, the vast majority of studies on substance use among immigrant youth only report differences by generation or nativity status. As our study demonstrates failing to disaggregate foreign nativity by years of residence in the US obscures critical differences in risk behaviors and can misguide policy makers and program planners. Similar to Blake and colleagues' (2001) findings, our study highlights the fact that a window of opportunity seems to exist shortly after immigrants arrive in the US when interventions could be integrated into schools and communities to prevent or at least delay the initiation of alcohol use (Blake et al., 2001). Because recently arrived immigrant youth are a low-risk population in terms of their substance use, there is an urgent need to maintain their low rates of alcohol, tobacco and marijuana use as soon as they enroll in school.

There are several reasons why risk of alcohol was higher among immigrants who had been in the US for more than four years compared to recently arrived immigrants. One explanation is that because alcohol is often the first substance that youth try, more of the foreign born subsample could have initiated alcohol use in their countries of origin. It is also possible that the age of initiating alcohol use is younger than tobacco or marijuana use for all youth in the sample, regardless of country of birth. However, we were not able to assess age of initiation or country where initiation began for any of the three substances, and could not test this theory. In addition, not only is alcohol more socially acceptable than tobacco or marijuana, but the fact that it is a strongly embedded feature of the adolescent experience in the US could have contributed to the unique pattern of alcohol use by generation/time in the US that we observed (Schulenberg & Maggs, 2002). It is not entirely clear why risk of tobacco and marijuana use among foreign-born took longer to converge with US-born youth than did alcohol. A possible factor may be diminished exposure to tobacco advertisements, particularly point-of-purchase and print advertising. Although tobacco advertising is less pervasive since the late 1990s and early 2000s due to the Master settlement agreement between the states and the tobacco industry, it remains disproportionately located in racial/ethnic minority and immigrant neighborhoods (Harwood et al., 2003; Tobler et al., 2009).

We also sought to test if the relationship between immigration-related factors and substance use differed by gender. Consistent with previous studies of adults, we found that this association also varies by gender among youth (Amaro et al., 1990; Borges et al., 2006; Vega et al., 1998). However, in contrast to past research – which demonstrated that female immigrants show larger effects of nativity and exposure to US culture on substance use – our results suggest that the relationship between generation/time in US, substance use and gender is contingent upon the specific substance in question. Marijuana use among both boys and girls showed a linear trend of increased use with subsequent generation and increased time in the US. By contrast, only boys displayed a protective effect of foreign nativity and fewer years in the US for tobacco use. Alcohol use among girls did not display a pattern of higher risk with increased time in the US. However, the risk of alcohol use for foreign born boys who had been in the US >4 years was significantly higher compared to recent immigrants, but indistinguishable from US-born males. Our findings of stronger effects of nativity/exposure to US culture on two of the three substances examined (i.e. tobacco and alcohol) for males contradict the majority of previous work in this area (Amaro et al., 1990; Borges et al., 2006). However, one study conducted among Puerto Rican youth in the Northeastern US did find that acculturation was associated with smoking cigarettes among males but not females (Smith, McGraw, & Carrillo, 1991).

It is not entirely clear why in our sample of youth, foreign-born boys displayed stronger effects of generation/time in the US for alcohol and tobacco compared to girls. One explanation might involve the fact that previous studies which consistently found stronger effects of nativity and exposure to US culture among women were not only conducted among adults, but were also done predominately among Mexican American samples (Amaro et al., 1990; Borges et al., 2006; Vega et al., 1998). In contrast, immigrants in our sample of *youth* were mainly from the Dominican Republic, Puerto Rico, Haiti and Jamaica where strict sanctions against women using tobacco and alcohol may now be looser relative to those in Mexico during the 1990s when the aforementioned studies were conducted (Amaro et al., 1990; Vega et al., 1998). A Global Youth Tobacco Surveillance report including data from 140 World Health Organization member states as well as US territories, failed to find differences in tobacco use by gender, and actually documented higher rates of smoking among girls than boys in countries such as Haiti, Brazil, Colombia and Puerto Rico, where many of the immigrant respondents in this study were born (Warren et al., 2008). As such, it is possible that foreign-born girls in this study ‘imported’ their smoking norms and behaviors upon migration to the US (Buttenheim et al., 2010). This finding points to the

importance of asking about pre-migration factors to help elucidate post-migration health status and risk behaviors, including substance use (Gupta et al., 2009).

Findings from the current study should be interpreted with several limitations in mind. First, substance use data were collected via self-report and can be considered a sensitive topic due to the fact that use of all three substances are prohibited for adolescents. Participants therefore may have underreported use, thereby generating an underestimate of the true prevalence. However, our prevalence estimates are comparable with other studies (Johnston et al., 2011; Mensch & Kandel, 1988). In addition, reporting biases may be another limitation of the study if for example recent or undocumented immigrants were more hesitant than other groups to report their substance use for fear of bringing shame to their families or to their communities.

This study is also limited in that we were unable to closely look at the relationship between substance use and generation/time in the US by country of origin. The main focus of the 2008 Boston Youth Survey was on youth violence rather than immigrant health. Information about country of origin was gathered by a single check-all-that-apply item that asked respondents to indicate where they are from. Because of the structure of this item and due to small sample sizes we were unable to analyze results by country of origin, and cannot say anything about how use of alcohol, tobacco or marijuana varies by immigrants from different countries of origin. Some studies examining how country of origin impacts substance use among immigrant youth have begun to emerge in the literature, but there is still much knowledge to be gained (Borges et al., 2007; Felix-Ortiz, Villatoro Velazquez & Newcomb, 2001). In addition, a greater understanding of pre-migration factors, such as use of alcohol, tobacco and marijuana in country of origin, combined with knowledge of the social and gender norms, and availability of substances in the sending countries would provide a broader context for studying substance use among immigrant youth in the US. Such information would likely reveal that the relationship between immigration related variables, substance use and gender is even more complex, but is crucial to designing preventive interventions that reflect the unique needs of a growing percentage of urban areas such as Boston and also the US as a whole.

Despite these limitations, our study advances the previous literature to underscore the idea that the protective effect of immigrant status differs depending on the substance in question and upon gender. For alcohol use the immigrant advantage is ephemeral and after four years of residing in this country it was completely eroded. With regard to tobacco and marijuana use the beneficial effects of foreign nativity seem to last at least a generation. Consistent with calls from other researchers, additional studies are needed to understand the particular socio-environmental factors that influence immigrant youths' adoption of risk behaviors such as substance use upon arrival in the US (Kulis et al., 2007; Frank, 2010; Frank, 2007). Results of this study point to the continued importance of considering the effects of gender, the socio-cultural environment and the unique experience of the audience in designing effective preventive intervention programs for substance use among youth (Cox et al., 2011).

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- Increased years in the US is associated with higher risk of alcohol, tobacco and marijuana use among immigrant youth.
- The protective effect of foreign nativity on alcohol diminishes much more quickly than for tobacco or marijuana among immigrant youth.
- Compared to girls, immigrant boys show stronger effects of exposure to US norms with regard to tobacco use.
- The first four years in the US are crucial to the acquisition of risk behaviors such as substance use among urban immigrant youth.

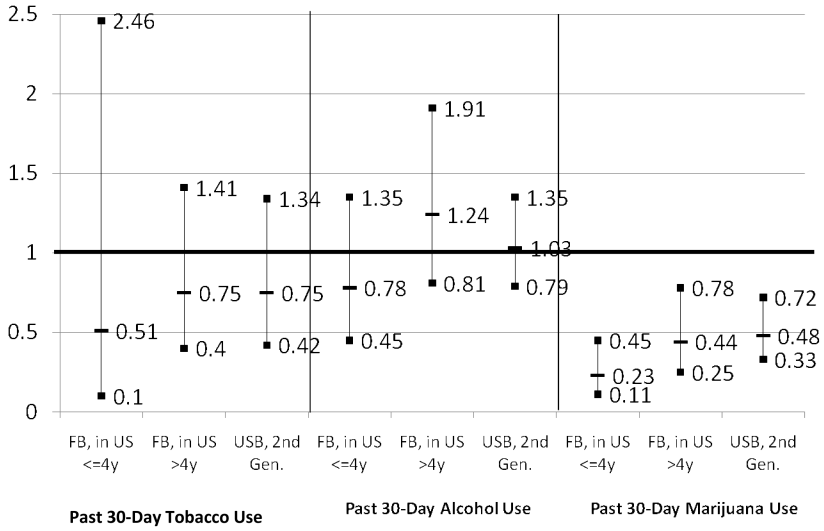

Figure 1a. Relative risk and 95% confidence intervals for substance use by generation/time in US, among girls

Note: The referent group is US-born, 3rd generation

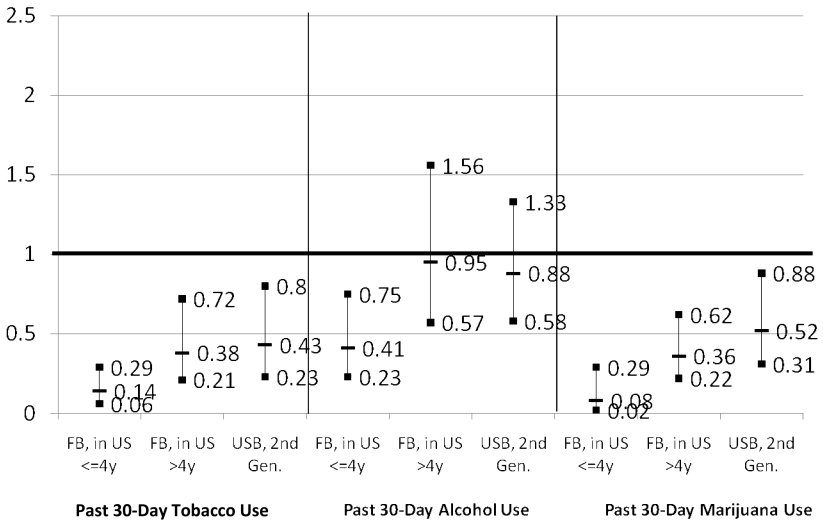

Figure 1b. Relative risk and 95% confidence intervals for substance use by generation/time in US, among boys

Note: The referent group is US-born, 3rd generation

Table 1

Reported country of origin by race/ethnicity and generation/time in US, Boston Youth Survey, 2008, n=1,485

	Race/Ethnicity*					Generation/Time in US†				Total
	Black	White	Latino	Asian	Other	1st/recent immigrant	1st/non-recent immigrant	2	3	
US Only	36.2 (222)	44.9 (66)	3.2 (16)	0.8 (1)	41.3 (38)	(0)	5.4 (16)	6.4 (38)	61.6 (289)	23.1 (343)
Another County	18.4 (113)	21.8 (32)	10.4 (52)	9.2 (12)	16.3 (15)	24.8 (32)	24.2 (72)	15.4 (91)	6.2 (29)	15.1 (224)
Haiti	16.3 (100)	(0)	0.4 (2)	(0)	3.3 (3)	12.4 (16)	8.4 (25)	10.5 (62)	0.4 (2)	7.1 (105)
Dominican Republic	(0)	(0)	30.5 (153)	(0)	2.2 (2)	13.2 (17)	16.8 (50)	14.4 (85)	0.6 (3)	10.4 (155)
China	(0)	(0)	(0)	61.1 (80)	(0)	20.9 (27)	5.4 (16)	6.1 (36)	0.2 (1)	5.4 (80)
Vietnam	(0)	(0)	(0)	24.7 (31)	2.2 (2)	1.6 (2)	4.4 (13)	3.1 (18)	(0)	2.2 (33)
El Salvador	(0)	(0)	6.4 (32)	(0)	0 (0)	3.1 (4)	2.7 (8)	3.4 (20)	(0)	2.2 (32)
Jamaica	9.5 (58)	(0)	0.2 (1)	(0)	6.5 (6)	4.6 (6)	5.1 (15)	5.3 (31)	2.8 (13)	4.4 (65)
Cape Verde	10.6 (65)	(0)	(0)	(0)	1.1 (1)	12.4 (16)	3.7 (11)	4.4 (26)	2.8 (13)	4.4 (66)
Colombia	(0)	(0)	4.2 (21)	(0)	(0)	1.6 (2)	4.7 (14)	0.9 (5)	(0)	1.4 (21)
Ireland	0.2 (1)	17.7 (26)	(0)	(0)	1.1 (1)	(0)	0.7 (2)	0.9 (5)	4.5 (21)	1.9 (28)
Puerto Rico	(0)	0 (0)	25.2 (126)	(0)	5.4 (5)	3.1 (4)	8.8 (26)	9.5 (56)	9.6 (45)	8.8 (131)
≥ Places	6.5 (40)	14.3 (0)	19.0 (95)	5.3 (7)	19.6 (18)	1.6 (2)	8.4 (25)	19.0 (112)	9.0 (42)	12.2 (181)
Missing	2.4 (15)	1.4 (2)	0.6 (3)	(0)	1.1 (1)	0.8 (1)	1.4 (4)	0.9 (5)	2.4 (11)	1.4 (21)

Note. Values are percentage, N.

*χ^2=2532.0, p<0.0001;

†χ^2=850.3, p<0.0001

Table 2

Relative risk of past 30-day alcohol, tobacco & marijuana use by generation/time in US among Boston public high school students

	Past 30-day Alcohol Use		
	Model 1	**Model 2***	**Model 3****
Generation/time in US	**RR (95% CI)**	**RR (95% CI)**	**RR (95% CI)**
≤4 years	0.59 (0.38, 0.89)	0.62 (0.46, 0.83)	0.66 (0.48, 0.90)
>4 years	1.14 (0.87, 1.51)	1.11 (0.87, 1.42)	1.18 (0.92, 1.52)
US-born (2nd generation)	1.02 (0.79, 1.32)	0.99 (0.82, 1.19)	1.02 (0.85, 1.23)
US-born (3rd generation)	1.0	1.0	1.0
	Past 30-day Tobacco Use		
	Model 1	**Model 2***	**Model 3****
	RR (95% CI)	**RR (95% CI)**	**RR (95% CI)**
Generation/time in US			
≤4 years	0.25 (0.12, 0.54)	0.27 (0.11, 0.68)	0.26 (0.10, 0.68)
>4 years	0.44 (0.26, 0.70)	0.52 (0.32, 0.86)	0.53 (0.32, 0.89)
US-born (2nd generation)	0.44 (0.28, 0.70)	0.57 (0.39, 0.83)	0.57 (0.37, 0.87)
US-born (3rd generation)	1.0	1.0	1.0
	Past 30-day Marijuana Use		
	Model 1	**Model 2***	**Model 3****
Generation/time in US	**RR (95% CI)**	**RR (95% CI)**	**RR (95% CI)**
≤4 years	0.11 (0.05, 0.21)	0.12 (0.06, 0.23)	0.13 (0.07, 0.23)
>4 years	0.42 (0.31, 0.57)	0.39 (0.28, 0.56)	0.41 (0.29, 0.57)
US-born (2nd generation)	0.52 (0.41, 0.66)	0.50 (0.39, 0.63)	0.50 (0.39, 0.64)
US-born (3rd generation)	1.0	1.0	1.0

*Model adjusted for gender, age, race/ethnicity

**Model adjusted for gender, age, race/ethnicity, hours spent on homework/week, family structure, perceived drug & alcohol problems in neighborhood